EUI WORKING PAPERS IN ECONOMICS

EUI Working Paper ECO No. 91/41

Assessing the Relative Sizes of Industry- and Nation Specific Shocks to Output

ROBERT JAMES WALDMANN

European University Institute, Florence

Please note
As from January 1990 the EUI Working Paper Series is divided into six sub-series, each sub-series will be numbered individually (e.g. EUI Working Paper **LAW** No 90/1).

EUROPEAN UNIVERSITY INSTITUTE, FLORENCE

ECONOMICS DEPARTMENT

EUI Working Paper **ECO** No. 91/41

Assessing the Relative Sizes of Industry- and Nation Specific Shocks to Output

ROBERT JAMES WALDMANN

BADIA FIESOLANA, SAN DOMENICO (FI)

Printed in Italy in June 1991
European University Institute
Badia Fiesolana
I–50016 San Domenico (FI)
Italy

ASSESSING THE RELATIVE SIZES OF INDUSTRY- AND NATION SPECIFIC SHOCKS TO OUTPUT

Robert James Waldmann

European University Institute

December 1990

Abstract. This paper discusses efforts to determine the relative strengths of supply and demand shocks to output. Alan Stockman has used an international panel of value added by industry to try to identify demand and supply shocks to output. He uses the identifying assumption that demand has a nation specific component while supply shocks are international and industry specific. Therefore shifts in a industry's output which are correlated with shifts in the output of different industries in the same country but are not correlated with shifts in output of the same industry in different countries are ascribed to demand shocks. Similarly shifts in output which are correlated within industries across countries but not across industries within countries are ascribed to supply shocks.

Stockman concludes that both demand and supply shocks are required to explain fluctuations in output. He estimates that identified nation effects and identified industry effects have a similar variance. Most of the variance is unidentified.

In different calculations Stockman assumes either that all industries are equally cyclical or that demand fluctuations explain an equal fraction of the variance of output of each industry. These assumptions are both false and lead him to underestimate the importance of demand relative to supply shocks. I follow Stockman but avoid the assumptions that bias his estimates of the variance of demand driven fluctuations. I conclude that identified demand shocks explain a substantially greater fraction of the variance of output than identified supply shocks.

I would like to thank Brad De Long, Larry Katz, and Larry Summers for helpful discussions.

For most of the past fifty years, macroeconomists have assumed that the principal source of macroeconomic fluctuations lies on the demand side. Recently this consensus has been challenged by "real business cycle theories" which assert that supply-side "technological" shocks are the principal cause of the business cycle (see, for example, Kydland and Prescott, 1982; Long and Plosser, 1983). This challenge has stimulated empirical work to determine the relative strength of supply and demand shocks to output.

One approach was to assume that demand-driven fluctuations were temporary, while supply-side technological fluctuations were permanent. Nelson and Plosser (1982) used this approach to argue that most of the variance in U.S. GNP growth over the past century was due to supply shocks. Their approach has been criticized on the grounds that their model had no place for transitory but long-lasting demand shocks like the Great Depression; indeed, it turned out that with the Depression excluded from their sample transitory fluctuations appeared to dominate (Delong and Summers, 1988a).

Although this approach has been extended (see, for example, Blanchard and Quah, 1989; Campbell and Mankiw, 1988; Durlauf, 1989), its underlying assumption appears dubious. There are many theoretical models in which persistent fluctuations occur without technological shocks (see, for example, Durlauf 1989, Greenwald and Stiglitz, 1988; Murphy, Shleifer, and Vishny, 1988; Shleifer, 1986). An alternative, relatively new approach to evaluating the relative sizes of demand and supply impulses is to compare the correlations of changes in output across different industries for the same country and across different countries for the same industry (see for example Stockman, 1988; Durlauf, 1989). Under the assumption that demand shocks are aggregate while supply shocks are narrowly-based and sector-specific, correlation between production growth across different industries for the same country suggests that demand shocks are important.

Such a correlation, however, could be consistent with real business cycle theories because sector-specific technology shocks could indirectly increase output in other sectors by (i) increasing the wealth of the average consumer, (ii) increasing demand for materials used in the directly-affected sector, and (iii) increasing demand for complements of the final output of the directly-affected sector.

The oil price shocks of 1973 and 1979 serve as obvious examples. Such shocks generate procyclical labor productivity, because in their aftermath output falls and labor productivity falls: the techniques of production used shift away from exploiting the now-expensive factor of production energy and toward intensively using labor. The reaction of the economy to the oil shocks thus follows the real business cycle pattern, and yet the positive correlation of output across sectors could lead Keynesian economists to see such oil-driven cycles as just additional examples of demand-driven procyclical productivity.

The possibility of cost shocks that fit the real business cycle pattern and yet affect many different sectors at once means that one cannot rely on the identifying assumption that aggregate shifts are demand-driven shifts. However, there is a way of identifying demand and supply shocks. Cost or supply shocks--like the oil shocks of 1973 and 1979--which directly affect labor productivity in many different sectors will also affect many different countries.

An international panel of value added by industry can thus be used to separate the effects of demand and supply shocks. Shifts in a sector's output that are correlated with shifts in output in other sectors in the same country, and yet are not correlated with shifts in output in the same sector in other countries, are prime candidates for the label of "demand." In a similar fashion, shifts in a sector's output that are correlated with shifts in output in the same sector in other countries, and yet are not correlated with shifts in output in other sectors in the same country, are prime candidates for the label of "supply." Shifts correlated with shifts in both other industries in the same country and the same industry in other countries remain unidentified.

An interesting and exceptionally thought-provoking paper by Alan Stockman (1988) has used an international intersectoral panel to try to identify demand and supply shocks to output. Stockman concludes that a significant fraction of the variance of output growth in industries within manufacturing can be accounted for by country*year dummies, in a regression that also includes industry*year dummies. His principal results are reported in table 1. The orthogonal nation effects have a variance 0.87 times as great as the orthogonal industry effects. Stockman concludes that it is unlikely that almost all macroeconomic fluctuations can be attributed to technology shocks alone.

Stockman's methods, however, lead him to underestimate the magnitude of nation-specific shocks to output and to underestimate the importance of demand relative to supply shocks. In this paper I follow Stockman's tracks but avoid his assumptions that biased down his estimates of demand-driven fluctuations. I conclude that the bias in Stockman's procedures led him to substantially underestimate the relative importance of the demand-driven component.

Stockman's Procedure

Stockman estimates equation 1:

$$(1) \qquad D\{\log(\text{Ind.Pdn.}(i,n,t))\} = m(i,n) + f(i,t) + g(n,t) + u(i,n,t)$$

where Ind.Pdn.(i,n,t) denotes the index of industrial production of industry i in nation n at time. The term m(i,n) is the mean growth rate over time of industry i in nation n. The term f(i,t) is a vector of industry-specific coefficients, one for each time t, common to all countries for industry i. The term g(n,t) is a vector of nation-specific coefficients, one for each time t, common to all industries in country n. Stockman intends g(n, t) to represent the effect of nation-specific aggregate demand shocks on production. And u(i,n,t) is a disturbance term, specific for year, industry, and country.

Stockman estimates equation (1) using quarterly and annual data on indices of industrial production in ten two-digit ISIC industries. His data span 1964:1 to 1985:2 for eight countries: Germany, France, Italy, Belgium, Netherlands, the United Kingdom, Switzerland and the United States. Stockman's country*time dummy variables are not orthogonal to the industry*time dummy variables. His results do not decompose the variance in sectoral industrial production growth into country-average, country-specific, industry-specific, and idiosyncratic components.

Moroever, Stockman's principal regressions suffer from the serious limitation that he assumes that the coefficients of country*year dummies are the same for all industries. He thus assumes that all industries have the same responsiveness to shifts in aggregate demand--that in the language of finance they all have the same b with respect to aggregate output.

Stockman recognizes in auxilliary regressions that his assumption that all industries exhibit the same responsiveness to aggregate output is dubious. In theory it would be possible for Stockman to estimate a separate b_i for each industry. Such a procedure would require a dummy country*year for one industry, and country*year*b_i dummies for other industries.

However, estimation of such a model would place heavy demands on Stockman's available computing power. Instead, he assumes that the b_i of industry i is proportional to the standard error of output growth in that industry--he assumes that the variances of the national, sectoral, and idiosyncratic components of output growth vary across industries in the same proportions. This assumption is tested below and rejected, leaving us uncertain how to interpret Stockman's results. His incorrect assumptions about different industries' b_i's certainly lead him to understate the magnitude of nation-specific movements in output, but Stockman's regressions themselves do not tell us how serious this understatement is.

Moreover, Stockman's estimates of the magnitude of nation and industry effects are biased upward by an additional effect: his nation*year and industry*year dummies pick up some of the idiosyncratic variance as well. Since the number of dummy right-hand-side variables is comparable to the number of data points, these biases are substantial. Since Stockman has ten industries and only eight countries, this bias is greater in the estimates of orthogonal industry effects than in the estimates of orthogonal nation effects.

An Alternative Framework

A more general formulation than Stockman's would be to regress the change of value added in industry i in country n on both (a) the international average change of value added in that industry, and (b) the change in aggregate output or productivity in that country:

$$(2)\ D\{\log(Y_{int})\} = c_{ni} + b_{ni}[D\{\log(Y_{nt} - Y_{int})\}] + g_{ni}[D\{\log(Y_{i(-n)t})\}] + e_{int}$$

where Y denotes value added, i and n denote industries and nations, respectively, Y_{nt} is aggregate value added in manufacturing and (-n) denote averages taken over all nations except n. Thus the percentage change in value added in industry i in nation n is regressed on the change in value added in the rest of manufacturing for that country, and on the average change in value added for the same industry in other countries. The variance of orthogonal industry-specific and nation-specific effects can then be determined from the partial R^2 of the coefficients g_{ni} on the international average for industry i and b_{ni} on aggregate output in country n.

This allows the same industry specific shocks to have different effects on the same industry in different countries. For example, the price of domestically-produced oil was controlled in the United States in the aftermath of the oil shocks. Consequently, the oil shocks should have had a smaller (or opposite) effect on value added in the United States chemical industry than on value added in the chemical industries of European countries. Thus simple separate regressions for each industry in each country can answer the question addressed by Stockman (1988), and can answer it without requiring his particular strong and implausible assumptions.

In my analysis I do not use Stockman's data source. Instead, I use the OECD International Sectoral Data Bank, which contains annual data on real value added, employment, and capital for fourteen OECD nations from 1960 to 1986. Since my approach will require a balanced panel, in order to obtain a sample of reasonably long length I am forced to focus on the seven nations for which data on real value added are available from the 1960s. These nations are the United States, Germany, France, Belgium, Finland, Norway, and England. (In principal, data are also available for the Netherlands; unfortunately a change in definitions in 1970 makes Dutch data form the 1960s incomparable to data from 1970 on.) Within these countries, data are available for seven ISIC industries within the manufacturing sector: food, textiles, paper, chemicals, non-metallic minerals, basic metal production, and mechanical equipment. For two additional industries; wood and wood products and other manufacturing industries, some nations reported no data at all. They were not used as dependent variables. Value added in manufacturing as a whole, including these industries, was available, and was used to calculate the right hand side variable. Obervations are complete from 1962 to 1985 (see Meyer zu Schlochtern, 1986), further limiting the size of my balanced panel.

Results

I perform 49 individual regressions of the pattern of equation (2). By allowing the b and g coefficients to differ for each industry in each country, I recognize that industries and countries have different characteristics. Furthermore, I exclude the output of that industry which is the dependent variable on the left hand side from the national and international averages which are the explanatory variables on the right hand side. This avoids a positive bias in the estimates of nation- and industry-specific effects caused by averaging the left hand side variable--including its idiosyncratic disturbance--with other data to create the right hand side variables.

Results are reported in table 2-4. Table 2 reports the estimates of the nation-specific coefficients. The averages of the coefficients taken across industries for a given nation n and taken across nations for a given industry i are reported along the borders of the table. They are to be interpreted as summary statistics, not as a recantation of the assertion that the true coefficients differ for different industries and nations.

The average estimates of b are similar for six of the seven countries, ranging from .526 for Belgium to .791 for the United Kingdom. By contrast, the average b coefficient for Norway is only 0.199. I interpret this as due to the enormous nation- and industry-specific shock experienced by Norway when oil was discovered in the North Sea. Equation 2 implicitly requires that this shock have the same effect on value added in other industries as an increase in aggregate demand.

More important, the b coefficients differ across industries. In particular, the food industry is almost acyclic, with an average coefficient across nations of only 0.279. Thus a one percent increase in manufacturing output corresponds to an increase of only 0.279 percent in food output. Other industries are more cyclical, with average coefficients across nations that range from 0.522 for paper to 0.781 for non-metalic minerals (i.e., stone, clay, and glass).

Table 3 reports industry-specific effects--the g coefficients of the responsiveness of an industry to the average rate of growth in the same industry in other countries. Again averages are reported for countries and industries. It is not surprising that Belgium, a small open economy, has the highest average g coefficient: 0.699. The prosperity of the basic metals industry in Belgium is very highly correlated with the prosperity of the basic metals industries of France and Germany no matter what is the ultimate source of output variability. It is also not surprising that the United States, a large closed economy, has the lowest average coefficient: 0.296.

Table 4 reports the partial R^2 of the coefficients reported in tables 2 and 3--that is to say the fraction of the variance in the dependent variable accounted for by the orthogonal nation- and industry-specific effects. This is equal to the increase in the R^2 when, for example, the growth of output in the rest of manufacturing is added to a regression already including the international average of the growth of value added in the industry. For each nation, the fraction of the total variance of industry growth explained by orthogonal nation- and industry-specific effects is reported. (This is, of course, different from the average of the partial R^2's.) Similar statistics are reported for the fraction of the variance in the output of industry i in all countries accounted for by the orthogonal nation- and industry-specific effects. Finally, the grand average of the fraction of variance explained by nation and industry effects is reported.

Orthogonal nation-specific effects account for 17 percent of the variance in output, while orthogonal industry-specific effects account for only 9.5% of the variance. To the extent that they can be distinguished, nation effects appear to be considerably greater than industry effects. These results are not strictly comparable to Stockman's because the sample of nations and industries is different. However, they do suggest that Stockman's assumptions led him to underweight the importance of nation-specific effects, and thus of demand shocks.

More importantly, the fraction of the variance explained by nation effects varies across countries in a reasonable manner. For the United States, fully 37.5 percent of the variance in industry value added growth can be accounted for by orthogonal nation- specific effects. By contrast, for Belgium such nation-specific effects can account for only 8.3 percent of the variance in output, and for Norway only 2.2 percent of the variance in output can be explained by nation effects.

These disparities directly contradict Stockman's working assumption that the partial R^2 of nation effects are the same for different nations. His assumption that the partial R^2 of nation effects are the same for different industries fails as well. The fraction of the variance accounted for by orthogonal nation-specific effects varies from 9.1 percent for the chemical industry, disproportionally affected by oil shocks, to 29.5 percent for mechanical equipment. The data clearly reject the assumption that the proportion of variance explained by nation effects is the same for all industries. And Stockman's adoption of this assumption does appear to bias down his estimate of the relative fraction of variance explained by nation effects.

Applying Stockman's Procedures to My Data

Since I use a different data set from Stockman, it is important to check that the differences in our conclusions spring from my allowing for b and g coefficients to vary and not from different characteristics of the data. I have therefore estimated statistics comparable to Stockman's using the OECD international sectoral data set.

Even though I possess a balanced panel, nation*year effects are still correlated with industry*year effects: in 1975 all nations and all industries had poor output growth. I decompose the variance in the change in log value added into a year effect, an orthogonal nation*year effect, and an orthogonal industry*year effect; in other words, I include year dummies as well as nation*year and industry*year dummies. The ratio of nation to year effects is only 1.23 when I use my data and Stockman-like procedures (results not shown)

Moreover, an substantial proportion of the orthogonal nation and industry effects obtained from Stockman-like procedures is spurious. Stockman reports f-statistics of 2.61 for industry effects and 2.94 for nation effects. The expected value of an F-statistic is 1 under the null hypothsis so more than one third of the effect reported by Stockm an is spurious. In my balanced panel there are seven nations and seven years, so estimated orthogonal industry and nation effects each pick up one-seventh of the idiosyncratic disturbance. I have also constructed corrected estimates of the variance of orthogonal nation and industry effects, still under the assumption that all b and g coefficients are one. These estimates are low: only 9.0 percent of the variance is accounted for by corrected orthogonal nation effects, and only 6.1 percent by corrected orthogonal industry effects. Stockman's estimates of the variance of his effects include part of the variance of the disturbance term (as do all fitted variances estimated by OLS), and in the OECD international sectoral data base I use this disturbance term is a major source of fitted variance.

Of course, this does not mean that the orthogonal nation and industry effects are small. The unconstrained estimates show that they are large. The problem is that the requirement that all industries have the same b and g biases the estimated orthogonal nation and industry effects down.

Conclusion

Needless to say, this reexamination of Alan Stockman's analysis does not threaten his principal conclusion: that there appear to be important nation-specific shocks that are not associated with industry-specific cross-national shocks, and thus that demand-driven fluctuations appear to play a significant role in the business cycle. This reexamination strengthens Stockman's principal conclusion: allowing for the fact that industries differ in their cyclicality increases estimated nation relative to industry effects.

REFERENCES

Blanchard, O. J.; and Quah, D. (1988). "The Dynamic Effects of Aggregate Demand and Supply Disturbances." National Bureau of Economic Research Working Paper no. 2737.

Campbell, J.; and Mankiw, N. G. (1988). "International Evidence on the Persistence of Economic Fluctuations." National Bureau of Economic Research Working Paper no. 2498.

Delong, J. B.; and Summers, L. H. (1988). "How Does Macroeconomic Policy Affect Output?" *Brookings Papers on Economic Activity* 1988:2 pp. 433-480.

Durlauf, S. N. (1989). "Output Persistence, Economic Structure and the Choice of Stabilization Policy." *Brookings Papers on Economic Activity* (forthcoming).

Greenwald, B.; and Stiglitz, J. E. (1988). "Financial Market Imperfections and Business Cycles." National Bureau of Economic Research Working Paper no. 2494.

Hall, R. (1980). "Employment Fluctuations and Wage Rigidity." *Brookings Papers on Economic Activity* 1980:1, pp. 1-141.

Hall, R. (1986a). "Market Structure and Macro Fluctuations." *Brookings Papers on Economic Activity* 1986:1, pp. 285-322.

Hall, R. (1988). "The Relation Between Price and Marginal Cost in U.S. Industry." *Journal of Political Economy* 96:4, pp. 921-947.

Kydland, F. E.; and Prescott, E.C. (1982). "Time to Build and Aggregate Fluctuations." *Econometrica* 50:6, pp. 1345-70.

Long, J. B.; and Plosser, C.I. (1983). "Real Business Cycles." *Journal of Political Economy* 91:1, pp. 39-59.

Meyer-zu-Schlochtern, F.J.M. (1988). *An International Sectoral Data Base for Thirteen OECD Countries*. OECD Department of Economics and Statistics Working Paper no. 57.

Murphy, K.; Shleifer, A.; and Vishny, R. (1988). "Industrialization and The Big Push." National Bureau of Economic Research Working Paper no. 2708.

Nelson, C.; and Plosser, C. (1982) "Trends and Random Walks in Macroeconomic Time Series." *Journal of Monetary Economics* 10, pp. 139-162.

Shleifer, A. (1986). "Implementation Cycles." *Journal of Political Economy*. 94, pp. 1163-90.

Stockman, A. C. (1988). "Sectoral and National Aggregate Disturbances to Industrial Output in Seven European Countries." *Journal of Monetary Economics* 21:3, pp. 387-409.

TABLE 1

ALAN STOCKMAN'S RESULTS

Model: D{ln[IP(i,n,t)]} = m(i,n) + f(i,t) + g(n,t) + u(i,n,t)

(A) Unadjusted data

Total SS = 6.45, Model SS = 4.77, R2 = 0.74

Total SS attributable to f(i,t) + g(n,t) = 3.27 = 50.7% of total SS

Effect	SS	% of Total SS	F-Stat	P-Value
Orthogonal Industry*Time	0.90	14.0%	2.61	0.0001
Orthogonal Nation*Time	0.79	12.2%	2.94	0.0001

(B) Growth rate of output divided by industry standard error

Total SS = 0.321, Model SS = 0.226, R2 = 0.70

Total SS attributable to f(i,t) + g(n,t) = 0.107 = 33.3% of total SS

Effect	SS	% of Total SS	F-Stat	P-Value
Orthogonal Industry*Time	0.023	7.2%	1.22	0.0430
Orthogonal Nation*Time	0.032	10.0%	2.14	0.0001

TABLE 2

COEFFICIENT OF OUTPUT ON AVERAGE GROWTH IN THE REST OF MANUFACTURING IN THE SAME COUNTRY

Industry\Country	U.S.A.	Germany	France	Belgium	Norway	Finland	England	Average
Food	0.095	0.236	0.523	0.147	0.397	0.340	0.215	0.279
	(0.114)	(0.091)	(0.241)	(0.107)	(0.379)	(0.153)	(0.042)	
Textiles	0.657	0.634	0.577	0.492	0.348	0.773	1.117	0.657
	(0.159)	(0.225)	(0.319)	(0.308)	(0.378)	(0.268)	(0.146)	
Paper	0.545	0.755	0.631	0.077	0.299	0.723	0.623	0.522
	(0.139)	(0.202)	(0.289)	(0.246)	(0.262)	(0.210)	(0.148)	
Chemicals	0.450	0.309	0.357	1.217	0.330	0.517	0.821	0.572
	(0.154)	(0.169)	(0.235)	(0.522)	(0.399)	(0.289)	(0.169)	
Stone, Clay	0.965	0.704	0.616	0.629	0.453	1.134	0.963	0.781
and Glass	(0.119)	(0.231)	(0.299)	(0.425)	(0.368)	(0.323)	(0.204)	
Basic	1.257	0.712	0.546	0.563	-0.249	0.461	1.311	0.657
Metals	(0.361)	(0.376)	(0.277)	(0.234)	(0.763)	(0.593)	(0.299)	
Mechanical	1.312	0.861	0.893	0.553	-0.180	0.227	0.485	0.593
Equipment	(0.178)	(0.187)	(0.258)	(0.251)	(0.384)	(0.318)	(0.147)	
Average	0.754	0.602	0.592	0.526	0.199	0.596	0.791	0.580
	(0.073)	(0.086)	(0.104)	(0.123)	(0.168)	(0.126)	(0.068)	(0.051)

Standard errors in parentheses.

TABLE 3

COEFFICIENT OF OUTPUT ON AVERAGE GROWTH IN THE SAME INDUSTRY IN OTHER COUNTRIES

Industry\Country	U.S.A.	Germany	France	Belgium	Finland	Norway	England	Averag e
Food	0.535	0.261	-0.494	0.270	0.478	0.749	0.546	0.335
	(0.451)	(0.251)	(0.550)	(0.323)	(0.418)	(0.912)	(0.134)	
Textiles	0.180	0.095	0.585	1.166	-0.328	0.524	-0.138	0.607
	(0.334)	(0.334)	(0.414)	(0.539)	(0.360)	(0.456)	(0.220)	
Paper	0.295	0.468	0.165	0.812	1.128	0.547	0.834	0.607
	(0.257)	(0.260)	(0.295)	(0.335)	(0.264)	(0.267)	(0.213)	
Chemicals	0.445	1.163	0.779	0.161	1.076	0.639	0.536	0.685
	(0.203)	(0.156)	(0.176)	(0.510)	(0.262)	(0.268)	(0.165)	
Stone, Clay	0.326	0.663	1.051	0.731	0.089	0.385	0.409	0.522
and Glass	(0.164)	(0.234)	(0.257)	(0.457)	(0.299)	(0.281)	(0.219)	
Basic	0.794	0.234	0.367	0.790	0.766	0.934	0.235	0.588
Metals	(0.420)	(0.293)	(0.178)	(0.191)	(0.469)	(0.498)	(0.238)	
Mechanical	-0.505	0.492	0.085	0.966	-0.099	0.894	0.484	0.313
Equipment	(0.303)	(0.285)	(0.321)	(0.444)	(0.516)	(0.525)	(0.273)	
Average	0.296	0.482	0.363	0.699	0.444	0.667	0.415	
	(0.121)	(0.100)	(0.127)	(0.157)	(0.144)	(0.191)	(0.081)	

Standard errors in parentheses.

TABLE 4
PARTIAL R-SQUARED OF ORTHOGONAL COUNTRY AND INDUSTRY EFFECTS

Industry\Country		U.S.A.	Germany	France	Belgium	Finland	Norway	England	Average	Ratio
Food	Country	0.030	0.198	0.183	0.072	0.152	0.048	0.338	0.101	2.267
	Industry	0.062	0.032	0.031	0.027	0.040	0.029	0.219	0.044	
Textiles	Country	0.389	0.207	0.093	0.071	0.291	0.034	0.693	0.248	5.075
	Industry	0.007	0.002	0.057	0.129	0.029	0.053	0.005	0.050	
Paper	Country	0.240	0.213	0.161	0.003	0.186	0.042	0.124	0.147	1.157
	Industry	0.021	0.049	0.011	0.177	0.288	0.137	0.108	0.127	
Chemicals	Country	0.169	0.022	0.025	0.137	0.062	0.023	0.182	0.091	0.521
	Industry	0.096	0.376	0.210	0.002	0.328	0.168	0.082	0.174	
Stone, Clay	Country	0.589	0.112	0.038	0.048	0.312	0.052	0.257	0.214	3.456
and Glass	Industry	0.035	0.097	0.150	0.056	0.002	0.065	0.040	0.062	
Basic	Country	0.258	0.095	0.099	0.076	0.021	0.004	0.279	0.126	1.266
Metals	Industry	0.076	0.017	0.109	0.225	0.094	0.147	0.014	0.099	
Mechanical	Country	0.730	0.276	0.303	0.109	0.025	0.009	0.218	0.295	5.698
Equipment	Industry	0.038	0.039	0.020	0.106	0.002	0.121	0.063	0.095	
Average	Country	0.375	0.137	0.109	0.083	0.121	0.022	0.292	0.170	
	Industry	0.056	0.118	0.097	0.099	0.130	0.118	0.049	0.095	
Ratio		6.754	1.161	1.121	0.845	0.935	0.186	5.903	1.796	

EUI WORKING PAPERS

EUI Working Papers are published and distributed by the
European University Institute, Florence

Copies can be obtained free of charge – depending on the availability of stocks – from:

The Publications Officer
European University Institute
Badia Fiesolana
I-50016 San Domenico di Fiesole (FI)
Italy

Please use order form overleaf

Publications of the European University Institute

To The Publications Officer
European University Institute
Badia Fiesolana
I-50016 San Domenico di Fiesole (FI)
Italy

From Name . . . .

Address . . . .

. . . .

. . . .

. . . .

. . . .

❒ Please send me a complete list of EUI Working Papers
❒ Please send me a complete list of EUI book publications
❒ Please send me the EUI brochure Academic Year 1990/91

Please send me the following EUI Working Paper(s):

No, Author . . . .
Title: . . . .
No, Author . . . .
Title: . . . .
No, Author . . . .
Title: . . . .
No, Author . . . .
Title: . . . .

Date . . . .

Signature . . . .

Working Papers of the Department of Economics Published since 1989

89/370
B. BENSAID/ R.J. GARY-BOBO/
S. FEDERBUSCH
The Strategic Aspects of Profit Sharing in the Industry

89/374
Francisco S. TORRES
Small Countries and Exogenous Policy Shocks

89/375
Renzo DAVIDDI
Rouble Convertibility: A Realistic Target

89/377
Elettra AGLIARDI
On the Robustness of Contestability Theory

89/378
Stephen MARTIN
The Welfare Consequences of Transaction Costs in Financial Markets

89/381
Susan SENIOR NELLO
Recent Developments in Relations Between the EC and Eastern Europe

89/382
Jean GABSZEWICZ/ Paolo GARELLA/
Charles NOLLET
Spatial Price Competition With Uninformed Buyers

89/383
Benedetto GUI
Beneficiary and Dominant Roles in Organizations: The Case of Nonprofits

89/384
Agustín MARAVALL/ Daniel PEÑA
Missing Observations, Additive Outliers and Inverse Autocorrelation Function

89/385
Stephen MARTIN
Product Differentiation and Market Performance in Oligopoly

89/386
Dalia MARIN
Is the Export-Led Growth Hypothesis Valid for Industrialized Countries?

89/387
Stephen MARTIN
Modeling Oligopolistic Interaction

89/388
Jean-Claude CHOURAQUI
The Conduct of Monetary Policy: What have we Learned From Recent Experience

89/390
Corrado BENASSI
Imperfect Information and Financial Markets: A General Equilibrium Model

89/394
Serge-Christophe KOLM
Adequacy, Equity and Fundamental Dominance: Unanimous and Comparable Allocations in Rational Social Choice, with Applications to Marriage and Wages

89/395
Daniel HEYMANN/ Axel LEIJONHUFVUD
On the Use of Currency Reform in Inflation Stabilization

89/400
Robert J. GARY-BOBO
On the Existence of Equilibrium Configurations in a Class of Asymmetric Market Entry Games *

89/402
Stephen MARTIN
Direct Foreign Investment in The United States

89/413
Francisco S. TORRES
Portugal, the EMS and 1992: Stabilization and Liberalization

89/416
Joerg MAYER
Reserve Switches and Exchange-Rate Variability: The Presumed Inherent Instability of the Multiple Reserve-Currency System

89/417
José P. ESPERANÇA/ Neil KAY
Foreign Direct Investment and Competition in the Advertising Sector: The Italian Case

* Working Paper out of print

89/418
Luigi BRIGHI/ Mario FORNI
Aggregation Across Agents in Demand Systems

89/420
Corrado BENASSI
A Competitive Model of Credit Intermediation

89/422
Marcus MILLER/ Mark SALMON
When does Coordination pay?

89/423
Marcus MILLER/ Mark SALMON/ Alan SUTHERLAND
Time Consistency, Discounting and the Returns to Cooperation

89/424
Frank CRITCHLEY/ Paul MARRIOTT/ Mark SALMON
On the Differential Geometry of the Wald Test with Nonlinear Restrictions

89/425
Peter J. HAMMOND
On the Impossibility of Perfect Capital Markets

89/426
Peter J. HAMMOND
Perfected Option Markets in Economies with Adverse Selection

89/427
Peter J. HAMMOND
Irreducibility, Resource Relatedness, and Survival with Individual Non-Convexities

* * *

ECO No. 90/1**
Tamer BAŞAR and Mark SALMON
Credibility and the Value of Information Transmission in a Model of Monetary Policy and Inflation

ECO No. 90/2
Horst UNGERER
The EMS – The First Ten Years
Policies – Developments – Evolution

ECO No. 90/3
Peter J. HAMMOND
Interpersonal Comparisons of Utility: Why and how they are and should be made

ECO No. 90/4
Peter J. HAMMOND
A Revelation Principle for (Boundedly) Bayesian Rationalizable Strategies

ECO No. 90/5
Peter J. HAMMOND
Independence of Irrelevant Interpersonal Comparisons

ECO No. 90/6
Hal R. VARIAN
A Solution to the Problem of Externalities and Public Goods when Agents are Well-Informed

ECO No. 90/7
Hal R. VARIAN
Sequential Provision of Public Goods

ECO No. 90/8
T. BRIANZA, L. PHLIPS and J.F. RICHARD
Futures Markets, Speculation and Monopoly Pricing

ECO No. 90/9
Anthony B. ATKINSON/ John MICKLEWRIGHT
Unemployment Compensation and Labour Market Transition: A Critical Review

ECO No. 90/10
Peter J. HAMMOND
The Role of Information in Economics

ECO No. 90/11
Nicos M. CHRISTODOULAKIS
Debt Dynamics in a Small Open Economy

ECO No. 90/12
Stephen C. SMITH
On the Economic Rationale for Codetermination Law

ECO No. 90/13
Elettra AGLIARDI
Learning by Doing and Market Structures

ECO No. 90/14
Peter J. HAMMOND
Intertemporal Objectives

ECO No. 90/15
Andrew EVANS/Stephen MARTIN
Socially Acceptable Distortion of Competition: EC Policy on State Aid

---

** Please note: As from January 1990, the EUI Working Papers Series is divided into six sub-series, each series will be numbered individually (e.g. EUI Working Paper LAW No. 90/1).

ECO No. 90/16
Stephen MARTIN
Fringe Size and Cartel Stability

ECO No. 90/17
John MICKLEWRIGHT
Why Do Less Than a Quarter of the Unemployed in Britain Receive Unemployment Insurance?

ECO No. 90/18
Mrudula A. PATEL
Optimal Life Cycle Saving With Borrowing Constraints: A Graphical Solution

ECO No. 90/19
Peter J. HAMMOND
Money Metric Measures of Individual and Social Welfare Allowing for Environmental Externalities

ECO No. 90/20
Louis PHLIPS/
Ronald M. HARSTAD
Oligopolistic Manipulation of Spot Markets and the Timing of Futures Market Speculation

ECO No. 90/21
Christian DUSTMANN
Earnings Adjustment of Temporary Migrants

ECO No. 90/22
John MICKLEWRIGHT
The Reform of Unemployment Compensation: Choices for East and West

ECO No. 90/23
Joerg MAYER
U. S. Dollar and Deutschmark as Reserve Assets

ECO No. 90/24
Sheila MARNIE
Labour Market Reform in the USSR: Fact or Fiction?

ECO No. 90/25
Peter JENSEN/
Niels WESTERGÅRD-NIELSEN
Temporary Layoffs and the Duration of Unemployment: An Empirical Analysis

ECO No. 90/26
Stephan L. KALB
Market-Led Approaches to European Monetary Union in the Light of a Legal Restrictions Theory of Money

ECO No. 90/27
Robert J. WALDMANN
Implausible Results or Implausible Data? Anomalies in the Construction of Value Added Data and Implications for Estimates of Price-Cost Markups

ECO No. 90/28
Stephen MARTIN
Periodic Model Changes in Oligopoly

ECO No. 90/29
Nicos CHRISTODOULAKIS/
Martin WEALE
Imperfect Competition in an Open Economy

* * *

ECO No. 91/30
Steve ALPERN/Dennis J. SNOWER
Unemployment Through 'Learning From Experience'

ECO No. 91/31
David M. PRESCOTT/Thanasis STENGOS
Testing for Forecastible Nonlinear Dependence in Weekly Gold Rates of Return

ECO No. 91/32
Peter J. HAMMOND
Harsanyi's Utilitarian Theorem: A Simpler Proof and Some Ethical Connotations

ECO No. 91/33
Anthony B. ATKINSON/
John MICKLEWRIGHT
Economic Transformation in Eastern Europe and the Distribution of Income

ECO No. 91/34
Svend ALBAEK
On Nash and Stackelberg Equilibria when Costs are Private Information

ECO No. 91/35
Stephen MARTIN
Private and Social Incentives to Form R & D Joint Ventures

ECO No. 91/36
Louis PHLIPS
Manipulation of Crude Oil Futures

ECO No. 91/37
Xavier CALSAMIGLIA/Alan KIRMAN
A Unique Informationally Efficient and Decentralized Mechanism With Fair Outcomes

* Working Paper out of print

ECO No. 91/38
George S. ALOGOSKOUFIS/
Thanasis STENGOS
Testing for Nonlinear Dynamics in Historical Unemployment Series

ECO No. 91/39
Peter J. HAMMOND
The Moral Status of Profits and Other Rewards: A Perspective From Modern Welfare Economics

ECO No. 91/40
Vincent BROUSSEAU/Alan KIRMAN
The Dynamics of Learning in Mis-Specified Models

ECO No. 91/41
Robert James WALDMANN
Assessing the Relative Sizes of Industry- and Nation Specific Shocks to Output

* Working Paper out of print